Paired Test for equality of means

Example

Typical prices of single-family homes in Florida are given for a sample of 15 metropolitan areas (in 1000 USD) for 2002 and 2003 in a CSV file.

Assuming the house prices are normally distributed, do we have enough statistical evidence to say that there is an increase in the house price in one year at 0.05 significance level?

This is a paired sample problem as the two observations (for 2002 and 2003) are taken on one sampled unit (a metropolitan area). Further, this is a one-tailed hypothesis problem, concerning population means μ_1 and μ_2, the mean house price in 2002 and 2003 respectively.

Paired test for Equality of Means

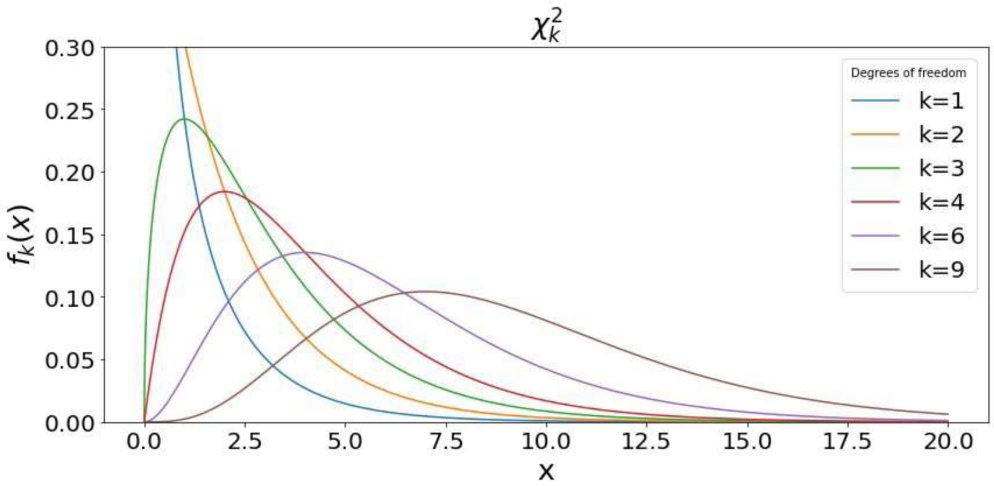
Significance of the test	Assumptions	Test Statistic Distribution
Test for equality of two population means $H_0 : \mu_1 = \mu_2$	• Continuous data • Normally distributed populations • Independent observations • Random sampling from the population	t distribution (The test is also known as **Paired t-test**)

Test for One Variance

Test for Variance

Variance tests are used for a comparison of variability, often as a predecessor for other tests

Let us take many samples of the same size from a normal population and find the sample variances



They follow a **chi-square (χ^2) distribution**, which is dependent on the degrees of freedom

Example

It is conjectured that the standard deviation for the annual return of mid cap mutual funds is 22.4%, when all such funds are considered and over a long period of time. The sample standard deviation of a certain mid cap mutual fund based on a random sample of size 32 is observed to be 26.4%.

Do we have enough evidence to claim that the standard deviation of the chosen mutual fund is greater than the conjectured standard deviation for mid cap mutual funds at 0.05 level of significance?

This is clearly a one-tailed test, concerning population variance, the variance for mid cap mutual funds.

Test for One Variance

Significance of the test	Assumptions	Test Statistic Distribution
Test for population variance $H_0 : \sigma^2 = \sigma_0{}^2$	• Continuous data • Normally distributed population • Random sampling from the population	Chi Square distribution (The test is also known as **Chi-square test for variance**)

Test for Equality of Variances

Example

The variance of a process is an important quality of the process. A large variance implies that the process needs better control and there is opportunity to improve.

The data (Bags.csv) includes weights for two different sets of bags manufactured from two different machines. It is assumed that the weights for two sets of bags follow normal distribution.

Do we have enough statistical evidence at 5% significance level to conclude that there is a significant difference between the variances of the bag weights for the two machines.

This is clearly a two-tailed test, concerning two population variances, the variance for bag 1 weights and the variance for bag 2 weights.

Test for Equality of Variances

Significance of the test	Assumptions	Test Statistic Distribution
Test for equality of two population variances $H_0 : \sigma_1^2 = \sigma_2^2$	• Normally distributed populations • Independent populations • Larger variance should be placed in the numerator	F distribution (The test is also known as **F-test for variances**)